

## Lightweight Concrete

Lightweight concrete has been used successfully in a variety of situations and has proven to be a useful material for bridge construction. However, it should not be indiscriminately used as a substitute for normal concrete. Its shear resistance and various other characteristics are generally not equal to normal weight concrete. Because of its brittle characteristic, it should not be used for railings or other structural members subject to vehicular impact. It is not recommended in corrosive environments.

The Standard Specifications provides materials specifications for two general classes of lightweight concrete: 109 to 115 lb/cf dry unit weight for concrete to be prestressed (this weight ensures that most of the fine aggregate will be natural sand as needed to prevent excessive creep), and 104 to 110 lb/cf dry unit weight for other work (this may or may not contain lightweight fine aggregate). Both of these classes are generally available from established plants in urban areas. The current cost for such concrete is about \$80/cy more than the current average price of regular weight 6-sack concrete.

A third class of lightweight concrete with a dry unit weight of 100 lb/cf maximum and consisting of all lightweight aggregate can be obtained for situations where weight is especially critical. However, most commercial plants are not equipped to produce this without equipment modifications, so an additional premium of about \$20/cy over the price of 110-lb lightweight concrete will usually be charged. Such special order material should only be used when the extra cost can be justified.

### Possible Uses

#### A. Deck Replacement and Rehabilitation

1. Applicable to both steel and concrete girders.
2. Increase cover to existing deck reinforcement.
3. Increase structural capacity of composite section without strengthening section below deck level.

#### B. Non-structural surfacing

1. Accommodate profile changes.
2. Limit added dead load on substructure.

#### C. Imported Aggregates

At locations where local aggregates are unsuitable, lightweight concrete might be competitive.

#### D. Long Spans

A lightweight superstructure may be cost effective for long spans.

The following table contains some of the specifications used for the design of lightweight concrete construction.

$f'_c$ psi @ 28 days	3,000	4,000	5,000*
$f_c$ psi, ** BDS 8.15.2.1.1	1,200	1,600	2,000
***Design wt.:			
Extra Light Concrete	113	--	--
Reinf. Concrete	120	120	120
Prestressed Concrete	125	125	125
n for design	9	8	7
E, for deflection	See BDS 8.7.1, 8.13.4, 8.15.3.4		
Shear resistance	See BDS 8.16.6.2.4		

\* Should not be used for general cast-in-place construction at job site.

\*\* Bridge Design Specifications (BDS)

\*\*\* Design weight assuming 13 lbs of steel per cf of concrete. Weight can be reduced if steel used is less than 13 pcf. Design weights are approximately 5 pcf less than fresh weights.

  
Philip C Warriner

  
Guy D. Mancarti

RSW dr

Replaces Memo to Designers  
21-47 dated Jan. 1982.